FRD ACTIVITIES REPORT
April 2006

Research Programs

Joint Urban 2003 (Oklahoma City Urban Dispersion Experiment)

Funding to analyze the JU03 tracer dispersion data is in the process of being transferred from the U.S. Dept. of Homeland Security. In accordance with that agreement, we will analyze and publish two joint papers with urban dispersion colleagues from the Pacific Northwest National Laboratory. Work has already begun on this project. (Kirk Clawson, 208-526-2742)

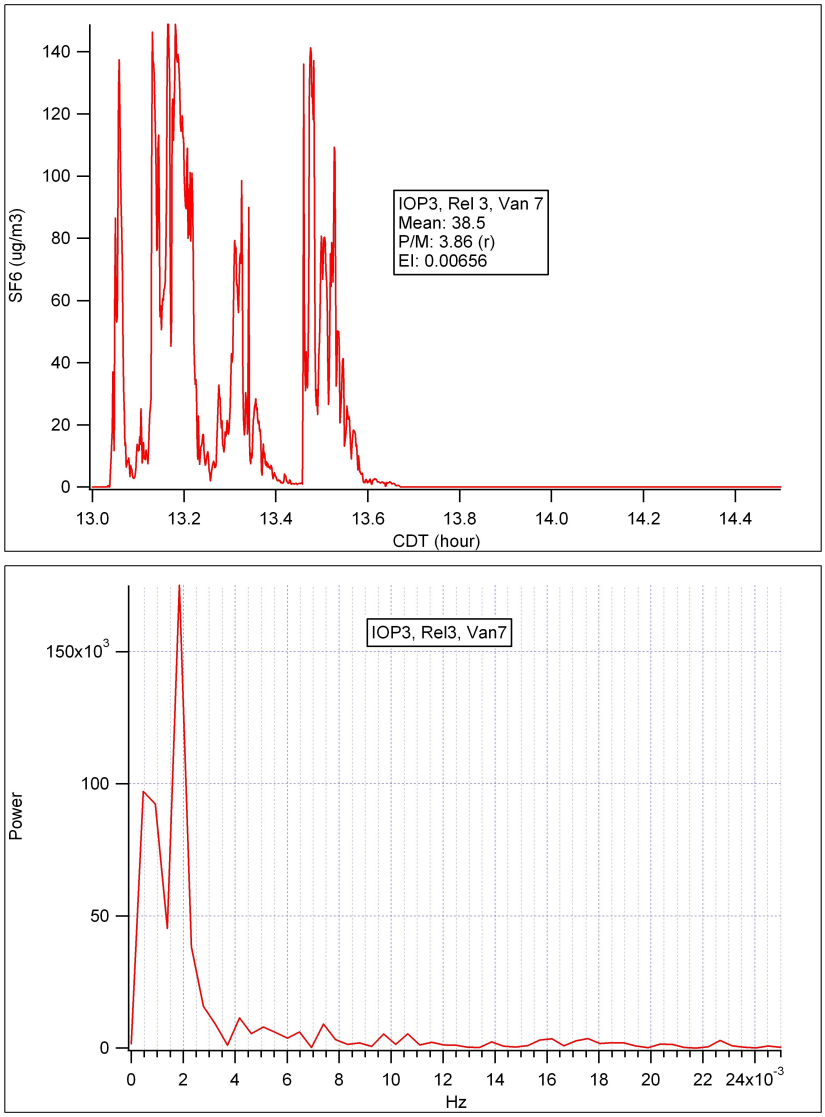

Figure 1. Concentration time history for SF_6 real-time analyzer number 7 during tracer release #3 of IOP 3 together with the average concentration and the peak to mean value (top). Periodogram of the data in the top graph (bottom).

A preliminary analysis of Intensive Observation Period (IOP) 3 from JU03 highlights two issues that might be important in considering how to deal with the consequences of a toxic plume release. The first of these is the fact that peak 5-second concentrations, approximately equal in length to the human breathing cycle, can be much higher than longer term average concentrations that are often used in modeling assessments of risk. Peak-to-mean ratios for 30 minute periods ranged as high as 43.6 with mean and median values of 9.2 and 6.4, respectively. Secondly, the peak concentrations have a definite tendency to exhibit periodic behavior with distinctive pulses of higher concentration occurring at approximately regular time intervals separated by periods of low concentration. A representative pair of graphs is included to illustrate this. The top portion of Fig. 1 shows a simple example of a concentration

time series from a single stationary real-time tracer analyzer. The bottom portion of Fig. 1 contains a periodogram of the data shown in top portion. Periodograms show any periodic behavior that might be present. In this case, the prominent peak at about 0.00185 Hz is approximately equal to 9 minutes. This can be seen in a close examination of the first graph and is commonly prominent in periodograms in all of IOP3. We will be examining other IOPs and analyzers for this behavior, which may have implications for future urban dispersion experiments. (Dennis Finn, 208-526-0566)

ET Probe

An oral presentation on the ET probe hurricane data was given at the 27th Conference on Hurricanes and Tropical Meteorology in Monterey, CA. The conference also provided an opportunity to discuss the ET turbulence data with some of the other groups that have deployed instruments into landfalling hurricanes. One interesting result was that the ET power spectra for the horizontal velocity components tend to have peaks at length scales near 500 m. Other groups with mobile radars have observed coherent structures (e.g., rolls) in the hurricane boundary layer that appear to have similar length scales. There is some possibility that the ET spectra may therefore provide information about these coherent structures.

Dr. John Schroeder from Texas Tech University also mentioned during the conference that his team is developing low-cost "stick" towers that can be deployed in under ten minutes. He is interested in possibly using ET probes on some of these towers. This would greatly speed up the deployment of the probes compared with the current tower design. The main hindrance for this collaboration is finding some mechanism that could fund both the NOAA and Texas Tech teams.

A point paper justifying the ARL activities in hurricane turbulence research was completed in April after incorporating many useful comments from scientists in ARL. It will now be submitted for consideration by OAR management. (Richard Eckman, 208-526-2740)

Smart Balloon

Six smart balloon transponders are in the process of being fabricated and tested for use during the TexAQS II study in Houston, Texas this summer. We are currently waiting for completion of modifications to our Iridium satellite phone modems that will allow the modems to work with our dataloggers. NAL Research in Virginia is making the necessary modifications.

FRD also participated in TexAQS II planning meetings held in Austin, Texas on April 18, 2006. Representatives from each of the participating organizations attended the meetings. During those meetings it was learned that the deployment of NOAA P-3 aircraft for TexAQS II has been delayed until August 15, 2006. Considering this, we will plan to be ready for our first smart balloon launch on or shortly after the arrival of the P-3 research aircraft in mid-August.

One day prior to the planning meetings in Austin, Barry Leffer from the University of Houston gave a tour of possible Houston smart balloon release sites. Contacts were also made with a contractor who provides temporary shelters that would be suitable for balloon preparation and pre-flight testing. (Randy Johnson, 208-526-2129)

UrbaNet

As part of the UrbaNet program, FRD and ATDD are discussing a possible collaboration related to the use of forecast winds and other variables in urban dispersion modeling. Models such as HYSPLIT are designed to use forecast output from systems like MM5 or NAM to drive the dispersion. On many occasions, however, model winds can be in obvious disagreement with current observations, so one has little confidence in the model winds at future times. It is not entirely clear what the user can do when these "busted" forecasts occur. FRD will encounter a similar problem if it starts using HYSPLIT with MM5 (or WRF) output to forecast dispersion from INL. If MM5 produces a bad wind forecast, FRD will need a recovery procedure that makes best use of the local Mesonet observations to correct the problem. This issue is therefore relevant both to UrbaNet and to the DOE partnership at Idaho Falls. (Richard Eckman, 208-526-2740, and Will Pendergrass, ATDD)

Urban Dispersion Program in New York City

Word was officially received this month that DHS has declined to fund a planned third urban dispersion field deployment in Lower Manhattan this coming summer. Indeed, the entire program is being prepared for mothballing. DHS will provide no funds for urban dispersion model improvement, verification, or validation. However, DHS will provide a small amount of funds for data analysis, data submission to the data archive, final report preparation, journal article preparation, and program termination. FRD will receive a portion of these funds. A principle investigator meeting is being planned for next month to discuss the use of these funds for program termination. (Kirk Clawson, 208-526-2742)

Atmospheric Tracer Chemical Analysis Upgrade

As part of our on going effort to improve our atmospheric tracer analysis capabilities, we have consulted with instrument manufacturers about a number of different technologies that may be used for measuring concentrations of the halogenated compounds we use as atmospheric tracers. Unfortunately, most of them do not provide the capabilities we need. However, we have found one type of detector that may be sensitive enough for our use while being less affected by other compounds which currently interfere with the analysis. We have arranged a short term lease of the detector so we can test it in our laboratory. (Roger Carter, 208-526-2745, and Debbie Lacroix)

PFT Atmospheric Tracer Chemical Analysis Development

The final method for PFT chemical analysis is being developed. The method was run without the autosampler manifold system and will be compared to the method with the manifold system in-line. There are apparently some sample carryover issues associated with the manifold. The method incorporating the manifold had to be postponed due to the receipt of some new detectors and the short turn-around time for their use. (Debbie Lacroix, 208-526-9997)

Cooperative Research with DOE NE-ID (Idaho National Laboratory)

Emergency Operations Center (EOC)

FRD is considering how it can provide improved information for EOC activities related to Fort St. Vrain in Colorado. The only meteorological data available for this location are from local airports and other standard NWS observation sites. FRD is therefore planning to use the ARL READY system to provide dispersion forecasts for Fort St. Vrain. It will be driven either by the 12 km NAM or 20 km RUC model output. The EOC procedures are being updated to reflect these changes. (Neil Hukari, 208-526-0503, Kirk Clawson, and Richard Eckman)

On 25 April, Team C attended their first EOC requalification drill of 2006. The drill was centered on a sodium-potassium fire at the INL's Material & Fuels Complex. Team C operated the MDIFF transport and dispersion model and forecasted the weather conditions during the drill. (Neil Hurkari, 208-526-0503, Roger Carter, and Dennis Finn)

INL Climatology

The 3rd Edition of the INL Climatography is again in preparation. This new edition, updated through March of 2006, will include new insights on winds and temperatures aloft derived from remote sensing systems, channeled wind flows and statistical wind trajectory groupings, and atmospheric transport and diffusion characteristics. The 3rd Edition of the INL Climatology will be useful to planners and operations staff that support the INL and to the general public. It is envisioned that an internal draft should be finished by midsummer. (Jason Rich, 208-526-9513, and Neil Hukari)

Further progress was made in completing a new Atmospheric Transport and Diffusion chapter for the revised INL climatology report. The draft now includes sections on plume, puff, and Lagrangian-particle modeling. It also discusses how the dispersion parameters in these models are linked to the diurnal evolution of the planetary boundary layer. (Richard Eckman 208-526-2740)

Other Activities

Papers

Eckman, R. M., R. J. Dobosy, T. W. Strong, P. G. Hall, 2006: In-situ measurements of 3D turbulence in Hurricanes Frances and Ivan using a pressure-sphere anemometer. Extended Abstract, *27th Conference on Hurricanes and Tropical Meteorology*, Monterey, CA, Amer. Meteor. Soc., paper 10C.4.

Safety

The safety video "That's the Rule!-Enforcing Safety Rules, Part II" was shown at the monthly staff meeting. A safety walkthrough of the office complex was conducted after the meeting. (Debbie Lacroix, 208-526-9997, and Kirk Clawson)

Travel

Kirk Clawson and Dennis Finn, April 10-13, Richland, WA, to meet with Jerry Allwine and Julia Flaherty of Pacific Northwest National Laboratory, to discuss plans for joint JU03 and UDP journal article publications.

Rick Eckman, 24-28 April, Monterey, CA, to attend the 27th Conference on Hurricanes and Tropical Meteorology and give an oral presentation on the ET probe hurricane data.

Training

All FRD employees holding the Government Travel Credit Card completed the required online refresher training course.

Personnel

Jason D. Rich, entered on duty April 3, 2006 as a Research Meteorologist. Jason has been working for the last two years as a contractor to FRD. Jason comes to us from Weathernews Americas Inc. (WNI) where he worked for 6 years. Prior to his employment at WNI, he received his B.S. in Meteorology from the University of Utah.